Digital Logic Design

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My Brief Introduction

- **Name: Dr. Kretika Goel**
- **Designation: Assistant Professor-II, Computer Science Department, DIT University, Dehradun.**
- **Qualification: B.Tech(UPTU) Gold Medalist, M.Tech (IGDTUW) Vice Chancellor Gold Medalist, PhD (IIT Delhi)**
- **Specialisation: Electronics and Communication**
- **Research Interest: Localization**, **Joint Communication and Sensing**, **Signal Processing**, **5G Communication**, **Sparse Arrays**, and **Direction of Arrival Estimation**

- **Teaching Subject::** Digital Logic Design, Computer Networks, Microprocessor, Analog and Digital Communication, Wireless Communication, Microwave and Radar Engineering, Signal Processing and Data Analytics, Digital and Optical Communication.

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Course Title	**Digital Logic and Computer Design**
Credits (L: T:P:C)	4:0:0:4
Contact Hours (L: T:P)	4:0:0
Prerequisites (if any)	None
Course Basket	Discipline Core

This course is the foundation course in design and analysis of the operation of digital gates. Students will learn the design and implementation of arithmetic and combinational circuits, concepts of Boolean algebra, minimization techniques along with various logic families and comparison of their behavior and characteristics.

Course Objectives

Objectives of this course are to acquire the knowledge of digital logic levels and digital electronics circuits. This course prepares students to perform the analysis and design of various digital electronic circuits.

Course Outcomes

On successful completion of the course, students will be able to achieve the following:
CO1: Understand electronic components and number system, binary arithmetic and logic gates.
CO2: Understand Boolean algebra and its application to combinational logic circuits.
CO3: Design Arithmetic circuits.
CO4: Design Combinational Circuits and Sequential Circuits.

Curriculum Content

UNIT 1: Electronic components and Number System (6L)

Semiconductor devices: Diodes, transistors (BJT and FET). Integrated circuits-an introduction, Popular IC packages, Digital electronics and its scope, Analog vs digital electronics. Decimal Number, Binary Number, Octal Number, Hexadecimal Number. Decimal to Binary, Binary to Decimal, Octal to Binary, Binary to Octal, Hexadecimal to Binary, Binary to Hexadecimal, Octal to Binary to Hexadecimal, Hexadecimal to Binary to Octal; Floating Point Number Representation.

UNIT 2: Binary Arithmetic and Logic Gates (7L)

Binary Addition and Subtraction, 1's and 2's compliments, subtraction using 1's and 2's compliments. AND, OR, NOT, XOR, XNOR, NAND, NOR gates and their truth tables, combining logic circuits for expressions using NAND and NOR gates. Gray Codes, BCD codes, Excess-3 codes, Concept of parity bits.

UNIT 3: Boolean algebra and Minimization Techniques (8L)

Boolean Logic Operations, Basic Law of Boolean Algebra, Demorgan's Theorem, Principle of Duality, Logical circuits using logical expression. Minterms and Maxterms, Sum of Product and Product of Sum Form, Minimization using K-map (Up to 4-Varriables) and don't care conditions.

UNIT 4: Arithmetic Circuits (6L)

Half Adder, Full Adder, Half Subtractor, Full Subtractor, 4-Bit Parallel Adder and Parallel Subtractor, Binary multiplier.

UNIT 5: Combinational Circuits and Sequential Circuits (7L)

Basic 2-inputs,4-inputs and 8-inputs Multiplexer, De-multiplexer, Basic Binary decoder, Binary Encoder Basics of Flip-Flops, Parallel and Shift Registers.

TEXT BOOK(S)

1. Digital Logic and Computer Design, M.M. Mano, Pearson Education, 2016.

REFERENCE BOOKS

1. Computer Architecture, M.M. Mano, PHI, 3rd Edition, 1998
2. Digital fundamentals, Floyd, L, Thomas, Universal Book Stall, 11th Edition, 2018